MPM2D
Examination
Exam A, 2011
Length: 3 hours
(Exam set for 2 hrs. + 1 hr. flex time)

OTTAWA-CARLETON
DISTRICT SCHOOL BOARD

Name : _____

Teacher : _____

School : _____

Instructions to students:

1. This examination booklet is **15 pages** long.
   Please check that you have all the pages.

2. Answer all questions with complete solutions in the spaces provided on the examination paper.

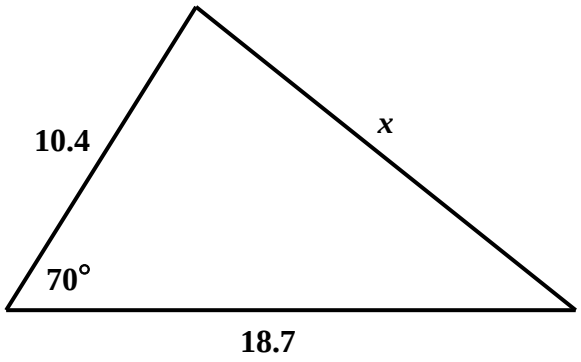
3. You may use any school-approved calculator on this examination.
   Make sure that your calculator is in **DEGREE** mode.
   Do **not** share your calculator.

4. There is a formula sheet that goes with the examination.

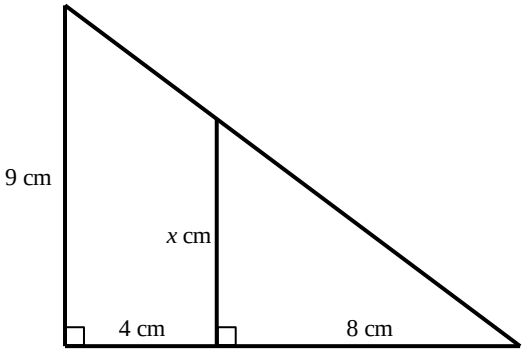
5. Diagrams are not drawn to scale.

A) Trigonometry

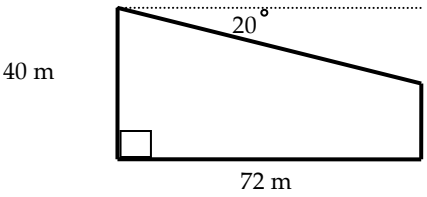
A1) **Solve** for *x*. Answer to 1 decimal place.



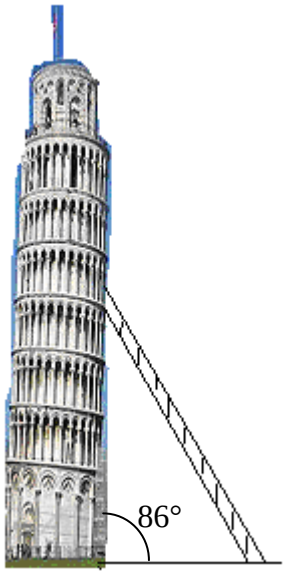
A2) **Solve** for *x*.



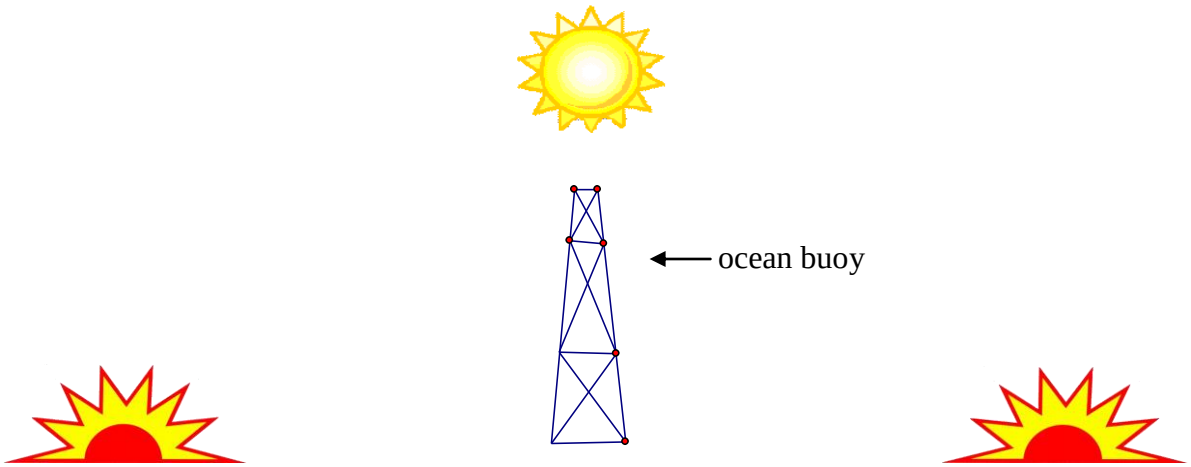
A3) The cost of materials to build a fence (fencing) is $8.50 per metre. **Determine** the cost of fencing the garden shown below.



A4) The Leaning Tower of Pisa forms an angle of 86° with the ground.
When it is leaning against the tower, the foot of a ladder is 2 m from the base of the tower, and the top of the ladder is 6m from the base of the tower.
The ladder slips down the tower so that it makes an angle of 55° with the ground.
Does the end on the ground slip more than the end against the tower?
Justify your answer.



A5) An ocean buoy is 2.0 m tall. At a certain time of day the shadow of the buoy is 1.0m long.
What possible length(s) will the shadow be 2 hours later?
The time from sunrise to sunset is 15 hours.
Justify your answer.
(**Note:** When the sun is overhead the shadow length is 0 m.)

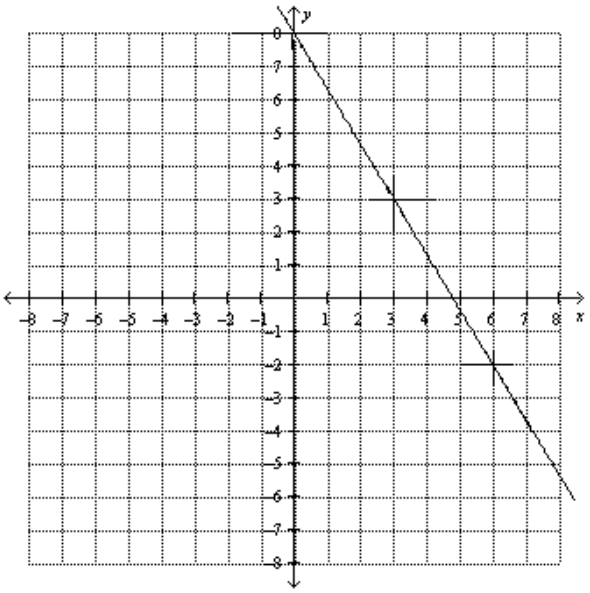


B) Analytic Geometry

B1) Two continuous linear relations are defined below:
Determine the point of intersection of the lines defined by these relations.
Justify your solution.

Relation 1:
$y = 2x - 3$

Relation 2:



B2) The school car wash charged $5 for a car and $6 for a van.
A total of 86 cars and vans were washed on Saturday and the amount earned was $475.
Determine the number of vans washed on Saturday.

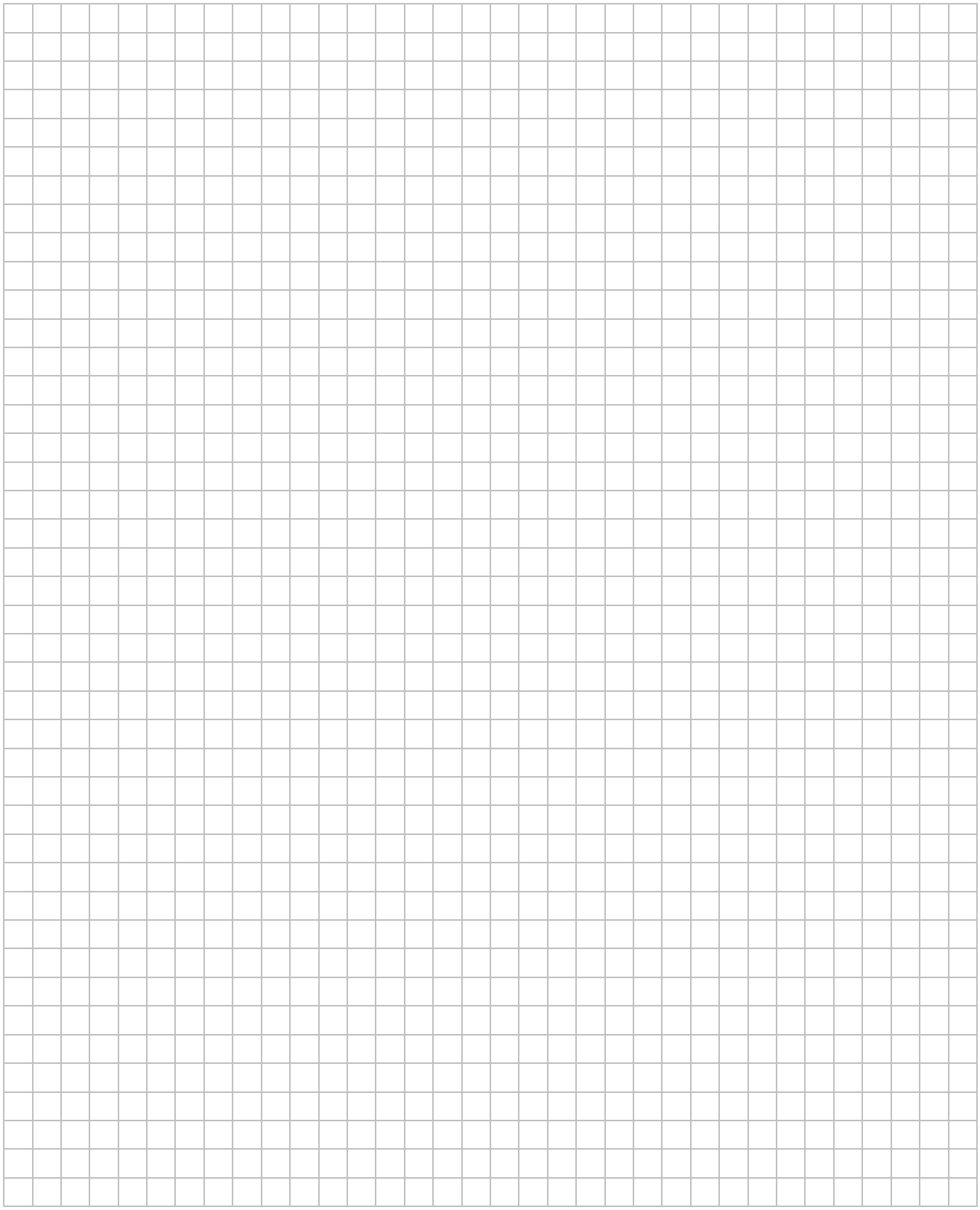
B3) Haidar says "if ΔABC is isosceles with AB = AC, then the perpendicular bisector of BC passes through A".
Is Haidar's statement true for the isosceles triangle with vertices (–4, 3), (3, 4) and (–2, –1)?
Justify your answer.

B4) Given the equation of the line $y = 2x$,

i) State the equations of three other lines so the four lines form a rectangle. Justify your choices.

ii) Determine the area of your rectangle.

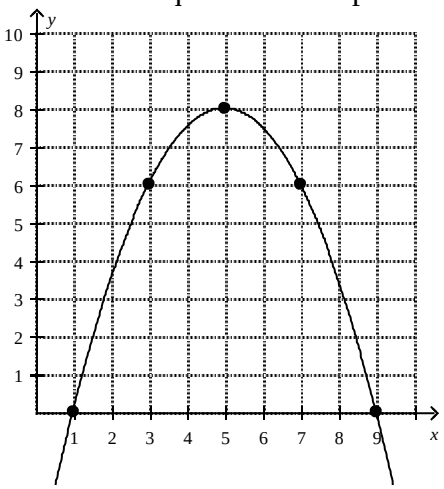
Show your work.



C) Quadratic Relations

C1) **State** the equation of a parabola that opens up and has two zeros. **Justify** your answer.

C2) **Determine** an equation of the parabola graphed below. **Show your work**.

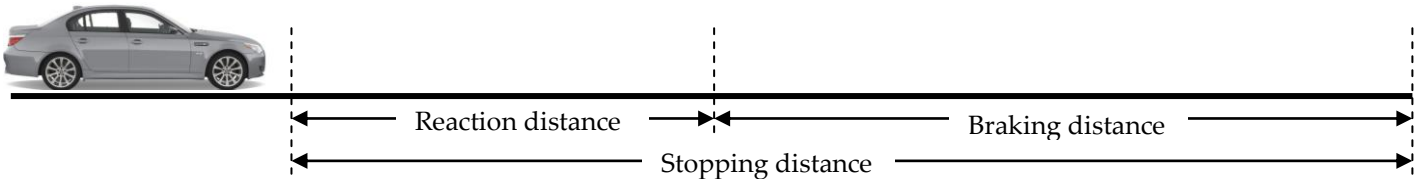


C3) A ball is thrown upward. Its height, *h* metres after *t* seconds, is given by the equation $h = -5t^2 + 20t + 1.8$ where 1.8 represents the height at which the ball is released.
Determine the maximum height of the ball.

C4) i) Use a <u>variety</u> of ways to **show** that $x^2 - 2x - 15 = 0$ has two solutions.

ii) **Explain** how changing one number in the equation $x^2 - 2x - 15 = 0$ can result in no solution. **Justify** your answer.

C5) When a driver decides to brake, the total distance required for the car to stop is made up of two parts: The Reaction distance (the distance from when the driver decides to stop to when he/she hits the brakes) and the Braking distance (the distance from when the brakes are hit to when the car stops completely).



The table below gives the distances required to come to a stop from several speeds when Sarah drives her car:

speed (km/h)	Sarah's reaction distance (m)	Car's braking distance (m)	Total stopping distance (m)
0	0	0	0
20	16	4	20
40	32	16	48
60	48	36	84
80	64	64	128
100	80	100	180
120	96	144	240

When John drives the same car the relationship between his total stopping distance, *d*, in metres and his speed, *s*, in km/h is $d = 0.01s^2 + 1.5s$.

Compare Sarah's and John's total stopping distances if they are traveling at 70 km/h.

Justify your answer.